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current, and that this decrease becomes greater as the frequency becomes higher. There is a marked analogy between this phenomenon and the decrease in the magnetic permeability in an alternating magnetic field as the frequency is increased, a fact which has been recently established by Niethammer and M. Wien.

WM. H. HOBBS.

DISCUSSION AND CORRESPONDENCE.

GEOLOGICAL TIME.

EDITOR OF SCIENCE: Sir Archibald Geikie's recent forcible plea to working geologists for the more careful accumulation of data which may yield reliable estimates of geological time, makes the interesting suggestion given in SCIENCE, October 27th, by Professor Wilbur C. Knight, under the title of 'Some New Data for Converting Geological Time Into Years,' seem very timely. The opportunities for making such calculations of the rate of retreat of cliffs under the action of subaerial decay, by employing slow-growing trees on the escarpments as a chronometer, are far wider spread than at first thought might seem likely.

In justice to the maiden work of a now eminent American geologist, it is proper to recall the fact that the first suggestion of this method and its first practical application were made by Dr. G. K. Gilbert, in 1866, when temporarily connected with the staff of the New York State Museum. After the excavation of the mastodon skeleton now standing in the State Museum, from a glacial pot hole in the valley of the Mohawk river at Cohoes, N. Y., Mr. Gilbert gave attention to an estimate of the rate of retreat of the cliffs of the river gorge, basing his observations on the degree to which the roots of the red cedars on the banks had been exposed by the falling away of the rock face. Mr. Gilbert's observations and deductions were published in the 21st annual report on the New York State Cabinet of Natural History (1871), and I quote from them the following paragraph: "Climbing from below or lowered by a rope from above, I have examined nearly all these trees and measured in each case the circumference of trunk and length of exposed root. I have also counted the rings of annual accretion

of several sections to ascertain the relation of size to age. From these data an idea may be obtained of the rate of recession of the cliff. The growth is exceedingly slow. A branch of one and one-eighth inch in diameter showed 100 rings of growth, and an average of six such branches gave 72 years per inch of diameter. The figures used below were obtained from two sections of trunks. One of these measures $19\frac{1}{2}$ inches in circumference and exhibits 310 rings; the other gave 11 inches and 270 rings. In these an inch of circumference represents 19.1 years, and an inch of diameter, 60 years."

He then gives a tabulation of results derived from 19 of these ancient gnarled cedars and by dividing the average measured length of exposed root by the average estimated age of the tree, arrives at the figure 15.2 inches as the rate of retreat of the rock face per century. This figure for other considerations he reduced to 12 inches per century and upon this calculation bases his final statement: "This gives as the time necessary to have removed the banks below the fall [Cohoes] from the deep channel to their present position, 35,000 years, which period I consider a minimum for the time that has elapsed since Cohoes falls were opposite the mastodon pot hole."

Twenty years ago the writer applied the same method to a calculation of the rate of retreat of the shale escarpments along Canandaigua Lake, N. Y., where these ancient cedars were at that time abundant, and had the satisfaction of arriving at a conclusion very like that obtained by Mr. Gilbert. Just where the weakness in such calculations may lie is not at once evident unless there be one in admitting the *annual* value of the growth rings in the tree. Mr. Gilbert's method, now revived by Professor Knight, merits renewed and general application. Employed with caution and care to exclude diverse agencies of retreat, it ought to afford eventually, important conclusions.

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NEWSPAPER SCIENCE.

TO THE EDITOR OF SCIENCE: So much has been published far and wide this last summer about my intention 'to scientifically demon-